A SEPTATE GASTROPOD FROM THE SILURIAN BUNGONIA LIMESTONE, NEW SOUTH WALES

ALEX G. COOK

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Michelia bauerae sp. nov., is a high-spired, extensively septate gastropod from the Late Silurian, lower Bungonia Limestone, Bungonia Caves, New South Wales. Extensive septation is confirmed within the Murchisoniidae. Septation is related to reduction in body volume, and avoidance of detrimental effects from apical breakage.☐*Michelia, Gastropoda, Murchisoniidae, septa, Silurian, Bungonia.*

Alex G. Cook, Queensland Museum, P.O. Box 3300, South Brisbane, Queensland 4101, Australia; 1 December 1993.

Septation is rare in high-spired gastropods but is more common in low-spired and discoidal forms particularly of the Euomphaloidea. Nine specimens of *Michelia bauerae* sp. nov. from the Bungonia Limestone confirm septation in the Murchisoniidae.

The Bungonia Limestone crops out 150km SW of Sydney, where it forms the basal Siluro-Devonian assemblage of the Wollondilly Tract in the Bungonia area. Carr et al. (1980) divided the Bungonia Limestone into upper, middle and lower limestone units separated by upper and lower shale members. Bauer (1993) reinterpreted the stratigraphy and provided a more detailed facies analysis.

Gastropods, bivalves and stromatoporoids were recovered from Flying Fortress Cave, part of the Bungonia Caves system; locality B17 of Bauer (1993) in lower limestone unit of Carr et al. (1980). The faunule occurs in shallow water, moderate to high energy, subtidal deposits (Carr et al.,1980; Bauer,1993) of late Ludlovian age (Carr, Jones & Wright,1980; Carr et al.,1980; Jones et al.,1981). I have herein used whorl profile to mean the cross sectional shape of the whorl (sensu Rohr,1980).

All material is lodged with the Queensland Museum (QMF).

SYSTEMATIC PALAEONTOLOGY

Phylum MOLLUSCA

Class GASTROPODA Cuvier,1797

Superfamily MURCHISONIOIDEA Koken,1897

Family MURCHISONIIDAE Koken,1897

Michelia Roemer,1854

Michelia Roemer, 1854: 73 (not sighted); Knight,1937: 710; Knight,1941: 194; Knight et al.,1960: 1292; Tassell,1976: 14.
Vetotuba Etheridge Jr., 1890: 62.

TYPE SPECIES

Michelia cylindrica Roemer, from the Middle Devonian of Germany; by subsequent designation of Knight (1937:710).

DIAGNOSIS

Large, high-spired, many-whorled, narrowly phaneromphalus gastropod with deep V-shaped sinus in outer lip. Whorl surface gently arched between shallow sutures, nearly flat (Knight,1941).

REMARKS

Knight et al. (1960) synonymised *Coelocaulus* Oehlert,1887 with its synonyms *Vetotuba* Etheridge Jr., and *Coelidium* Clarke & Ruedemann,1903 (Knight,1941,1944) with *Michelia*, Roemer,1854. Knight et al. (1960) questionably synonymised *Melissosia* Clarke. Tassell (1976) accepted these synonymies and assigned the type species of *Vetotuba* to *Michelia*. Rohr (1980) differed with Knight et al. (1960) separating *Coelocaulus* on views expressed by Ulrich & Scofield (1897). If Rohr's (1980) view is maintained, and Knight's (1944) opinion also accepted then *Vetotuba* cannot be placed within *Michelia*. Knight (1941: pl. 453), however, stated that Oehlert's (1887) figures overemphasise the boundaries of the selenizone, and that topotype material he illustrates shows only a weak selenizone. Type and topotype material of *Coelocaulus* (Knight,1941) does not demonstrate

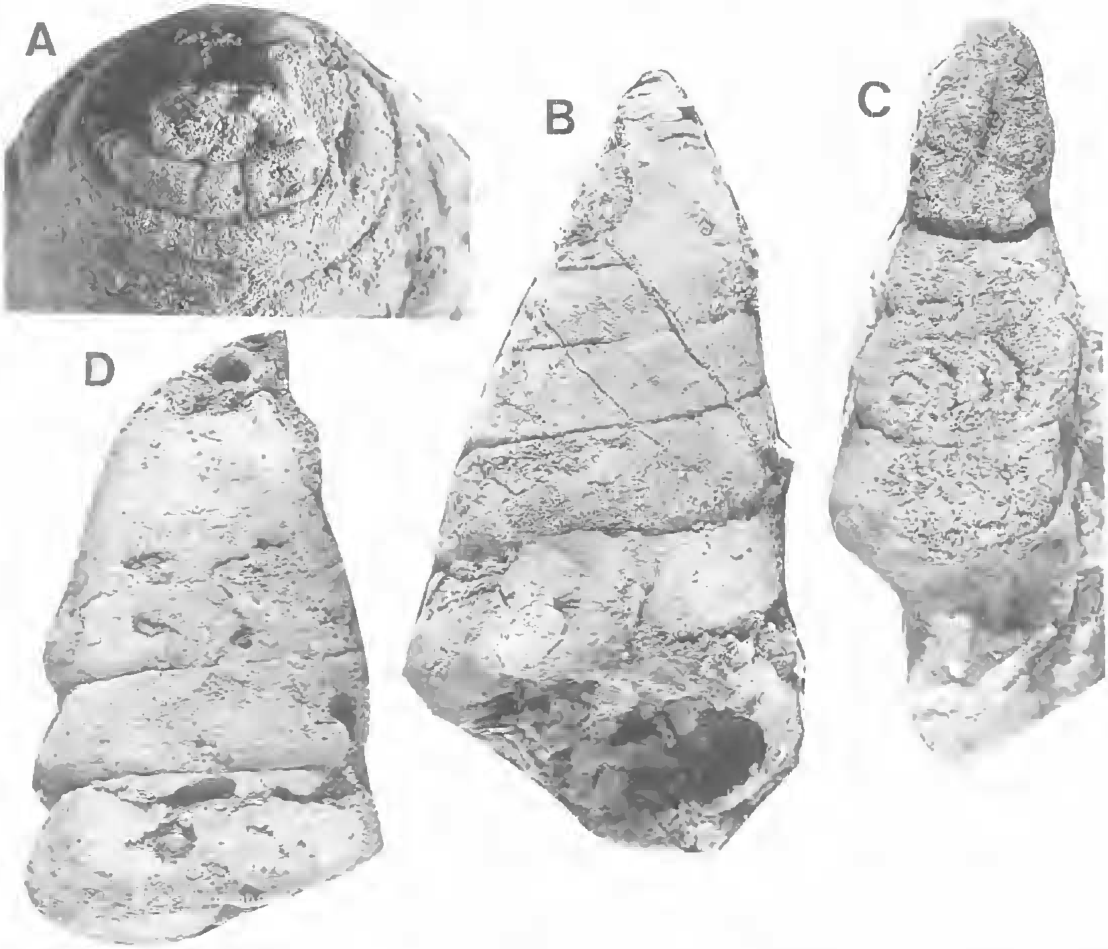

FIG. 1. *Michelia bauerae* sp. nov. A, paratype, QMF25726, apical whorls, x3; B, holotype, QMF25723, x1; C, paratype, QMF25747, worn, abraded, showing prominent septa, x1; D, paratype, QMF25722, side view, x1.

the flattened base typical of *Michelia* and *Vetotuba*. Thus I maintain synonymy of *Vetotuba* with *Michelia* and separate *Coelocaulus* from *Michelia* on the basis of basal profile.

Michelia bauerae sp. nov.
(Fig. 1)

DIAGNOSIS

Very large, cyrtoconoid, narrowly phaneromphalous gastropod with flattened whorl surface between slightly impressed sutures.

MATERIAL EXAMINED

HOLOTYPE: QMF25723.
PARATYPES: QMF25722,25724–25727,25747,29314.

AGE AND OCCURRENCE

Late Silurian (Ludlovian), Flying Fortress Cave, Bungonia Caves, Bungonia, New South Wales; lower Bungonia Limestone.

DESCRIPTION

High-spired, slightly cyrtoconoid shell, very large, up to 100mm (Table 1), width up to 52mm. Narrowly phaneromphalus with rounded, flattened base. Apical angle c.40°, apices missing from all specimens. Whorl surface flattened between slightly impressed sutures; sutural slope approximately 15°. Subovate to rounded rectangular whorl profile. Growth lines known only from QMF29314, upon which 3 poorly preserved fine collabral lines are inclined opposedly on whorl surfaces strongly suggesting angular, V-

TABLE 1. Shell parameters for material of *M. bauerae* sp. nov.

	H	W	A	M	No.	S
QMF25722	76	51	43	2		
QMF25723	100	52	42	1	4	2.7,4.2,2.3
QMF25723					5	3.4
QMF25724	51	32	*	2	6	1.0,0.5,0.5,0.5,0.7
QMF25726	71	39	41	1	4	2.7,2.5,4.2
QMF25727	97	33	36	3	7	5.5,4.6

H = shell height (mm); W = maximum width (mm); A = apical angle (°); M = missing whorls (estimated); No. = whorl number; S = septal spacings (mm).* = disrupted.

shaped sinus. First 4–7 whorls extensively partitioned with thin, moderately arcuate, variably-spaced septa (Table 1).

REMARKS

The cyrtoconoid form, narrow persistent umbilicus and sinus allies the species to *Michelia* Roemer. *M. bauerae* has a flatter whorl surface than the type species (Knight,1941: pl.42, fig.1) and it is much larger. *M. brazeri* (Etheridge Jr.) has similar whorl surfaces, but the Bungonia species is approximately twice the size, and does not express the obvious pseudoselenizone. *M. darwini* (de Koninck) is a smaller form. De Koninck's (1876) type has an obvious flattened profile, and narrow umbilicus and a more equidimensional whorl profile (Tassell,1976,1982) compared to the horizontally elongate aperture of *M. bauerae*.

ETYMOLOGY

For Julie Anne Bauer who collected and donated the material.

SEPTATION

According to Yochelson (1971) extensive septation is restricted to the Euomphalidae, but extensive septation is now known within Omphalocirridae (Linsley, 1978), Loxonematidae, Pleurotomarioidea (Yochelson; 1971, pers. comm.) and Murchisoniidae (herein). It has been noted (Cook,1993) that septation is most common within discoidal, discoidal open-coiled, and low nondiscoidal forms. *Micromphalus turris* Knight,1945 and *Fletcherviewia septata* Cook, 1993 are high-spired exceptions and *Straparollus (Euomphalus) hoffmani* Linsley & Yochelson, 1973 is a medium-spired form.

Varying opinions of septa are that they 1, add strength to the shell (Yochelson,1971); 2, eliminate the need to maintain elongate body mass (Yochelson,1971; Linsley & Yochelson, 1973; Cook,1993); and 3, allow for abandonment of early whorls and early whorl breakage without detriment (Morris & Cleevely,1981; Cook,1993). Yochelson(1971) suggested that septation related to the need for sessile forms to redistribute calcium carbonate.

Extensive septation is present within the first 4–7 whorls of this taxon. Spacing of septation within *M. bauerae* is variable according to whorl position, and within each whorl (Table 1); earlier whorls commonly show more widely spaced septa, but in later whorls septa are closer together. These limited data show that partitioning did not result in incremental body volume or body length change at a constant rate. Irregular spacing of partitions within septate gastropods has been noted (Yochelson,1971).

The primary role of septa in *M. bauerae* is perceived to be body shortening, albeit spasmodic, and avoidance of detrimental effects of apical breakage. The thin septa relative to the thick shell suggest little need for strengthening and no advantage through increased weight in the upper shell.

Shell growth in gastropods is episodic (Linsley & Javidpour,1980), and this may be reflected in septal spacing with uneven spacing showing changes in the ability to secrete shell, a response to vitality fluctuations. Given the high energy environment interpreted for the taxon's occurrence, changes in vitality could be expected. This suggests external control, related to seasonal or other fitness fluctuations given that shell secretion costs considerable energy (Wilbur & Saleuddin,1983).

Linsley & Javidpour (1980) speculated that build-up of calcium salts within the mantle prior to episodes of growth, necessitates rapid secretion of large sheets of carbonate. During periods less conducive to shell formation, calcium salt build-ups within the mantle, acquired through active ion uptake (Linsley & Javidpour,1980), could have subordinately been reduced by secretion of thin septa allowing body shortening and calcium salt reduction without extensive fitness loss.

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